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Tunable lasers face price barriers

By Craig Matsumoto
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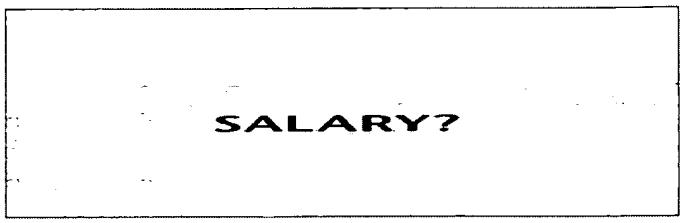
BUILDING THE PACKET NETWORK

Among the promising developments in optical components is tunability, which would allow lasers, filters and other components to adjust to particular wavelengths. Although tunable lasers and filters have only begun their rollout, vendors already have their eyes on several other functions–such as chromatic dispersion compensation, being pursued by Phaethon Inc.–that could benefit from tunability as well.

Tunable lasers, the most highly publicized tunable components, potentially solve a logistics headache. The advent of wave-division multiplexing (WDM) allows multiple wavelengths of light to share the same fiber-optic cable. But it takes one laser to produce each of those wavelengths, and as the power of WDM has grown to 160 wavelengths per fiber, the collection of lasers needed has become unwieldy.

"Each one has its own product code, and each one has to be managed line by line," said Kevin Affolter, director of marketing for tunable-laser manufacturer Agility Communications Inc. (Santa Barbara, Calif.). "If you can go from, say, 192 product codes to just one or two, you don't have to worry about forecasting the product mix." But companies aren't willing to pay much of a premium to eliminate the inventory.

"Tunability doesn't drive any architectures," said Rohit Sharma, chief technical officer of systems vendor ONI Systems Corp. (San Jose, Calif.). "As a



systems designer, I may agree to pay a 10 percent to 20 percent premium, but I certainly wouldn't pay a 100 percent premium," which is what some tunables are demanding.

In fact, price is likely to be the stumbling block as tunable lasers emerge. The problem is that some tunable lasers have deviated too far from the structure of a regular laser. "You would have to achieve tunability with a very simple structure that doesn't deviate far from DFBs [distributed-feedback lasers] so you can get to high-yield, high-volume manufacturing," Sharma said. The price would be acceptable if the applications were more exotic, but that won't be the case for tunable lasers any time soon. "The real sweet spot for a lot of the tunability will be in applications that are not on the market yet," said Mike Arden, an analyst with KMI Corp. (Providence, R.I.).

Tunable-laser makers also will need to band together in multiservice agreements (MSAs) that will dictate physical package sizes for their parts. An MSA would ensure that board designers wouldn't be forced to use a single vendor's laser.

Without MSAs, "it just makes it that much more of a risk for us, because you're betting on that company being successful," Sharma said. "A couple of ways of developing tunables will win out. The [manufacturers] may use different technologies, but they have to agree on one package."

Swedish startup Altitun AB, now owned by ADC, was among the first vendors to announce its tunable-laser plans and has an MSA agreement with Agility. Nortel Networks appears to be a front-runner as well after its acquisition of CoreTek; Nortel in March announced it had begun sampling its tunable lasers for 40-Gbit/second transmission.

More than a dozen other startups have been developing tunable lasers, but none has hit on the right formula, according to Sharma. "If you take all of the startups and established players together, collectively they've achieved the right things," Sharma said. But no single company has hit them all. "There isn't an easy, obvious winner out there."

On the receiving end of a tunable laser is a tunable filter to catch particular wavelengths of light. In some cases, companies are developing lasers and filters simultaneously. Many of those companies are building the devices out of microelectromechanical systems (MEMS). Specifically, they're using rows of pop-up mirrors to deflect the light.

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"A number of [MEMS] companies that had indicated they were entering this space announced tunable lasers and tunable filters," said Marlene Bourne, an analyst covering MEMS for Cahners In-Stat Group. Some companies are developing lasers, filters, variable optical attenuators and MEMS cross-connects, hoping to gain some economies of scale by developing all four. "It kind of illustrates how the use of the technology has expanded to a system-level solution. Over a year's time, three other product areas have been launched, and yet people are still fixated on switching." Bourne predicts a market of $67 million for the four MEMS segments combined this year, rising to $2.3 billion in 2005.

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News Release

March 19, 2001

Nortel Networks Ships MEMS-Based Tunable Lasers for System Trials

Strengthens 40 Gbps Component Portfolio; Adds New Flexibility to Optical Networks

BOSTON – Building on its global leadership position in providing high-performance components and modules for optical networks, Nortel Networks* [NYSE/TSE: NT] has shipped for system trials the industry's first MEMS-based tunable lasers for 40 Gbps systems.

Nortel Networks MEMS-based tunable laser broadens its portfolio of wavelength agile components and modules, joining Nortel Networks LCW5 high-power, continuous wave (CW) laser. The MEMS-based tunable laser is scheduled for general availability in the fourth quarter of this year. LCW5 is now generally available for large volume deployments.

"This demonstrates our business strategy of bringing cutting edge, tunable components to market quickly through field trials and then volume manufacturing for wide deployment," said Barbara Callaghan, president, High-Performance Optical Component Solutions (HPOCS), Nortel Networks. "Both tunable lasers demonstrate our commitment to delivering wavelength agile solutions to service providers and optical equipment vendors."

Tunable lasers are expected to be deployed initially to alleviate costly inventory management associated with fixed lasers in optical systems. Ultimately, they are intended to help position service providers for evolution to more advanced network architectures.

Nortel Networks tunable laser technology is designed to support build out of intelligent, next generation optical networks to address future, customer-centric applications. Tunable lasers are expected to enable service providers to isolate, route and manage individual wavelengths, allowing them to serve customer specific traffic in line with demand.

Based on patent pending MEMS (micro electro-mechanical system) technology, the tunable laser employs two microscopic mirrors – one a curved mirror that is deposited on a tiny, precision membrane. As the membrane is driven up and down by a change in electrostatic force, the distance between it and the laser cavity's lower mirror changes, selecting a wavelength. Precise control of this process allows continuous tuning to any wavelength in the C or L band. The MEMS-based tunable laser has successfully completed critical parametric testing for 40 Gbps transmission and exceeded design criteria for 40 Gbps optical transport equipment.

The robust LCW5 temperature tuned laser illustrates Nortel Networks expertise in volume manufacturing. The 20-channel CW laser features an

integrated wavelength locker and reduced footprint that eliminates fiber handling and further component qualification and procurement. The laser is controlled remotely and can be automatically adjusted to one of 20 DWDM (dense wavelength division multiplexing) channels in a predetermined section of either the C or L DWDM bands. Testing has shown it to be suitable for DWDM applications ranging from 2.5 to 40 Gbps when used in conjunction with an external modulator.

Nortel Networks will demonstrate its optical component and module solutions at Optical Fiber Conference 2001 (booth #1540), March 19-21 in Anaheim, Calif.

Nortel Networks High-Performance Optical Component Solutions business is one of the largest and fastest growing optical component and module businesses globally. The business is a world leader in the design, development and manufacture of high-value modules for the Optical Internet, including those for 10 and 40 gigabits per second systems. It has established industry leadership and competitive differentiation by translating the art of innovation and design into volume manufacturing of components and modules that are at the heart of the high-performance Internet. It has employees in Harlow and Paignton, United Kingdom; Ottawa, Ontario; Boston, Mass. and Raleigh, NC; and Sydney, Australia.

Nortel Networks is a global Internet and communications leader with capabilities spanning Optical, Wireless, Local, Personal Internet and eBusiness. The Company had 2000 U.S. GAAP revenues of US$30.3 billion and serves carrier, service provider and enterprise customers globally. Today, Nortel Networks is creating a high-performance Internet that is more reliable and faster than ever before. It is redefining the economics and quality of networking and the Internet, promising a new era of collaboration, communications and commerce. Visit us at www.nortelnetworks.com.

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